PUMPS FOR FILTRATION SYSTEMS

ABSTRACT OF THE DISCLOSURE

Improvements in product water throughput from a reverse osmosis (RO) membrane filter achieved by thinner feed spacers in the RO element, enhanced recovery (ratio of permeate to feed), pressure recovery of the retentate fluid pressure opposing the feed water pressure, and fluid pulsing of the RO element feed stream. The system of the invention preferably comprises a dual head reciprocating pump, an RO element, and a differential pressure activated ("DPA") valve. The DPA valve, in combination with connecting the two pump heads to reduce required pump pressures, generates energy recovery. The frequency and amplitude of the reciprocating pump create a pulse wave in the RO element that improves permeate quality and throughput. A control system preferably monitors system parameters to optimize the reciprocating pump speed and amplitude in order to obtain maximum throughput and permeate quality from any given RO element configuration. Also a highly compact, portable RO system comprising a piston and a DPA valve. The piston separates the feed chamber from the retentate chamber. The pressure difference between the two chambers determines the pressure recovery of the system. The DPA valve opens and closes hydraulically to automatically control the retentate discharge as the system is pumped.